Experiment 2: Diodes, Bipolar Junction Transistors and MOS Characterization

3 Lab

3.1 Diode Parameter Characteristic

Plot \( \log(I_d) \text{vs} . V_d \) curve. Fit the ideality factor of the diode: 

Plot \( I_d \text{vs} . V_d \) curve with 100mA compliance.

Fit the saturation current \( I_s: \) \______________\, series resistance \( R_s: \) \______________\.

Plot \( I_d \text{vs} . V_d \) curve with 10nA upper limit.

Plot \( C_d \text{vs} . V_R \) curve and \( \frac{1}{C_d} \text{vs} . V_R \).

Extract the zero bias capacitance \( C_{j0A}: \) \______________\, built-in voltage \( V_j: \) \______________\

3.2 Bipolar Junction Transistor Characterization

Plot \( I_c \text{vs} . V_{CE} \) curves with different \( I_B \).

What is the averaged early voltage \( V_A: \) \______________\.

Plot \( \beta_F \text{vs} . I_C \).

Plot \( C_{BC} \text{vs} . V \) curve and \( \frac{1}{C_{BC}} \text{vs} . V \).

Extract the zero bias capacitance \( C_{j0A}: \) \______________\, built-in voltage \( V_j: \) \______________\

3.3 MOSFET Characterization

Plot \( I_D \text{vs} . V_{DS} \) curves with different \( V_{GS} \). Label the cutoff, triode and saturation regions on the plot.

What is the channel length modulation \( \lambda: \) \______________\.

What is the transconductance \( G_m \) with a bias of \( V_{GS} = 2.1V \) and \( V_{DS} = 1.5V: \) \______________\.

What is the transconductance \( G_m \) with a bias of \( V_{GS} = 2.1V \) and \( V_{DS} = 0.06V: \) \______________\.

Plot \( I_D^2 \text{vs} . V_G \), extract \( V_{TH}: \) \______________\ and \( K_n: \) \______________\.
Plot $C_{GS}$ vs. $V_{GS}$ curve.

What zero bias drain gate capacitance $C_{GD}$: ________.